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SPACE CENTER Roundup

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Station awaits arrival of first visitors

By James Hartsfield

An international crew of seven will become the first visitors to dock with the new International Space Station when *Discovery* lifts off on shuttle mission STS-96 in May.

Discovery will bring supplies and equipment to prepare the station for the arrival of the Russian-built Service Module living quarters this fall and begin laying out the welcome mat for the first station crew, scheduled for launch early next year.

"One of the most complex aspects of this flight will be the docking, with the Zarya module in control of the station rather than the Service Module, because it wasn't originally designed that way," STS-96 Lead Flight Director Wayne Hale said. "Another difficult aspect of the mission is just the number and volume of things that we have to get done and the amount of time we have to do them in."

Navy Commander Kent Rominger will perform the docking and command *Discovery*'s crew, which includes cosmonaut Valery Tokarev, a colonel in the Russian Air Force, and Canadian astronaut Julie Payette as mission specialists, reflecting the truly global nature of the new

station with three of five partners represented aboard the shuttle.

U.S. Air Force Lt. Col. Rick Husband will serve as pilot, and a space walk will be performed by astronauts Tammy Jernigan and Dr. Daniel Barry while *Discovery* is docked to the station.

Jernigan and Barry will attach a JSC-developed spacewalkers' "crane" to the exterior that will assist in future assembly activities. Parts of a Russian "crane" also will be attached. Mission Specialist Ellen Ochoa rounds out the crew as flight engineer and a mission specialist. Ochoa will operate the shuttle's mechanical arm from inside the cabin during the space walk.

Discovery is targeted for a launch at 9:32 a.m. CDT on May 20, and is planned to dock to the station two days later. During six days attached to the International Space Station, the crew will transfer more than 5,000 pounds of equipment from the shuttle to be stowed on the new outpost.

"It's going to be very exciting for us to enter the station and we'll all feel like pioneers because there has only been one other crew on board," Rominger said. "We're really getting ready for the first expedition crews to go up...taking things like food, clothes, a lot of spare equipment

to stow. I take a lot of pride at being involved in the station program, especially at this stage, because it is historic."

Much of the gear destined for the station will be housed inside a double Spacehab module in *Discovery*'s payload bay. The space-walking gear and cranes will be stored outside in the shuttle bay on a new piece of equipment called the Integrated Cargo Carrier, a removable platform that will be used on many future station assembly flights. The carrier, which will remain in the shuttle bay on STS-96, also includes a new space-walking equipment storage box developed by Spacehab. On the day after *Discovery* docks, Jernigan and Barry will conduct the space walk. Jernigan will spend much of the time in a foot platform at the end of the shuttle's mechanical arm, operated by Ochoa.

"What you'll see is the arm going from the carrier, where Tammy and Dan unlatch the equipment, up to where we are going to place it on the station," Ochoa said. "As we proceed through the space walk, you'll basically see the arm going back and forth to the carrier as we transfer different types and pieces of equipment."

The next day, flight day five, the crew will enter the station. Among the first activities will be maintenance work. Payette and Tokarev will install 18 new, cellular phone-sized battery charge-discharge units in the Zarya module. The units, known by the Russian acronym MIRT, will replace faulty units and are expected to allow the station's six batteries to be more fully charged.

"We can't do any transfer of equipment into the Zarya at the time when we change out the chargers, because they are underneath the floor of the module,"

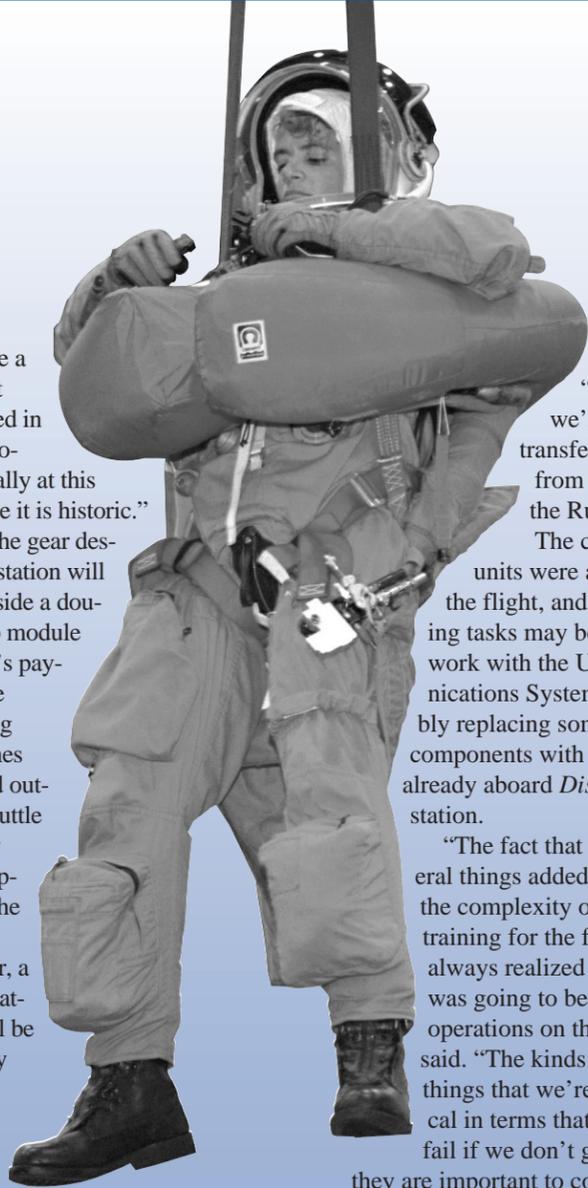
Payette said. "Once that is done we'll be able to start transferring equipment from the Spacehab to the Russian module." The charge-discharge units were a late addition to the flight, and other late-breaking tasks may be added, including work with the U.S. Early Communications System in Unity, possibly replacing some of that system's components with spare items already aboard *Discovery* and the station.

"The fact that we have had several things added late has increased the complexity of planning and training for the flight, but we have always realized that flexibility was going to be a key element of operations on the station," Hale said. "The kinds of maintenance things that we're doing aren't critical in terms that the station would fail if we don't get them done. But they are important to continuing smooth operations of the station."

While docked to the station, the crew also will evaluate a system to be used on future missions to transfer fluids and gases from the shuttle to the station. Although nothing will be transferred using the system on this mission, the lines, controls and mechanisms will be tested.

After six days, *Discovery* will undock from the station and perform a flyaround, circling the station twice, to survey and photograph the exterior. A day later, on flight day 10, the crew will eject a small, innovative educational satellite called Starshine from a canister in the cargo bay. Although only slightly larger than a basketball, the Starshine satellite is composed of more than 900 highly polished mirrors that will allow it to be visible from the ground. More than 1,000 schools worldwide are participating in the project and have helped construct the satellite. Students will track Starshine after its release, calculating its orbit, as they learn about math and physics.

After almost 10 full days in orbit, *Discovery* is planned to land at Kennedy's shuttle runway at about 4:30 a.m. May 30. ■



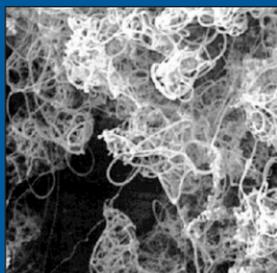
JSC Photo S99-00591 by Mark Sowa

STS-96 Astronauts Rick Husband, left, pilot, and Dan Barry, mission specialist, look toward Canadian Space Agency Astronaut Julie Payette, mission specialist, as she simulates a parachute drop into water during emergency bailout training. Husband and Barry had earlier "parachuted" into the deep pool at the Neutral Buoyancy Laboratory and quickly deployed their rafts. SCUBA-equipped diver, who supported the training exercise, looks on at left.



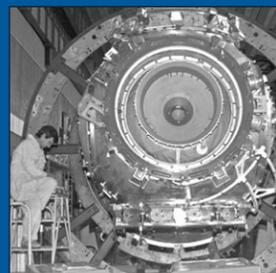
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INTERNATIONAL SPACE STATION UPDATE

Flight controllers continue to work communications problem

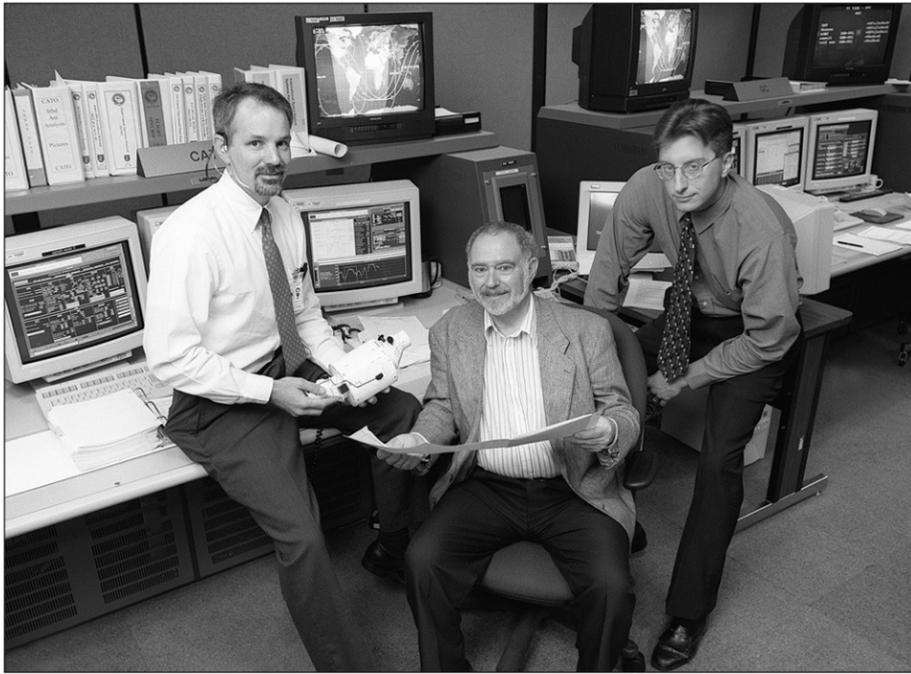
International Space Station flight controllers in Houston and Moscow continue to analyze a persistent low signal strength reading on the Starboard Omni antenna on Unity. The antenna, one of two used by the U.S. Early Communications System, has shown degradation in its ability to receive signals from the Tracking and Data Relay Satellite when the station is in certain orientations. Forward link signal is lost in certain antenna regions.

"We are continuing to function fine with this anomaly in the system," said Mark Martin, NASA communications and tracking officer. "We just have to take more care in our commanding so that we don't attempt to command to the vehicle when we are operating in the degraded region of the antenna."

On March 3, flight controllers noticed a definitive change in the performance of the antenna. Since that time, the Flight Control Team, supported by engineering experts in the Mission Evaluation Room, has conducted a number of tests to understand and characterize the problem. Downlinked video from a camera on board the Zarya module ruled out any type of extreme antenna movement. Flight controllers had suspected that the antenna had moved, resulting in the change in the signal pattern.

The tests were complicated by the fact that Zarya's Motion Control System is powered off most of the time during this phase of the mission. As a result, no direct information on the attitude of the spacecraft and where the antenna is pointing at any given time is readily available.

United Space Alliance employee Tim Stockdale, a pointer from the Operations



JSC Photo S99-04701 by Robert Markowitz

Mark Martin, left, NASA communications and tracking officer, Louto Barquet, who works on the communications and tracking function for The Boeing Co. in the Mission Evaluation Room, and United Space Alliance employee Tim Stockdale, a pointer from the Operations Division, discuss problems associated with an anomalous Starboard Omni antenna aboard the Unity module.

Division, developed a unique technique to ascertain this information based upon trajectory information of the ISS and observed signal strengths. Working with the communications and tracking officers to determine the arrival and loss of signal, he deduced a halfway point and backed out the attitude rate and the spin of the vehicle. Using software tools to establish the look angles to the Tracking and Data Relay Satellite, he was able to correlate the data to determine that

there was a hole in the antenna pattern. He then established the look angles to the TDRS with respect to the anomalous antenna to deduce the problem.

"We were able to rule out blockage after we performed some additional tests on the phased-array antennas which project in the same area as the anomalous Omni antenna," said Stockdale. "These antennas indicated normal signals throughout the whole range of look angles, thereby ruling out blockage."

Flight planners for the STS-96 mission are budgeting time in the mission to survey the antenna with the shuttle's robotic arm prior to a space walk by astronauts Tammy Jernigan and Dan Barry. No repair hardware is planned to be taken aboard *Discovery* since the slightly reduced communications capability has had minimal impact on operations. If the problem is with the antenna itself, as flight controllers suspect, the STS-101 crew will install a new antenna during the mission currently scheduled for December.

ISS Flight Director Sally Davis is proud of the work her team has done in resolving this anomaly. "I'm very pleasantly surprised with the maturity and the analytical capabilities of these flight controllers. I am very proud to be associated with them."

Louto Barquet, who works on the communications and tracking function for The Boeing Co. in the MER, echoes this sentiment. "Tremendous teamwork has been involved in defining and resolving this anomaly. Employees at White Sands and Goddard have been involved as well as JSC flight controllers and engineers, United Space Alliance engineers, other contractor personnel and us."

The U.S. Communications System, installed on shuttle mission STS-88 last year, is one of two complementary communications systems on the station, including a Russian communications system on board Zarya. ■

ISS viewing opportunities from the ground can be found on the Internet at: <http://spaceflight.nasa.gov/realdata/sightings/>

Center is ready to kick off its annual Savings Bond campaign this month

JSC's 1999 U.S. Savings Bond campaign begins May 17 and continues through May 28. Employees will receive more information about savings bonds during the campaign.

Buying savings bonds is one of those fortunate transactions where both the buyer and seller profit. Interest rates are based on market yields of actively traded Treasury notes and bills and are adjusted every six months, climbing as market rates increase. Each May 1 and November 1, the Treasury announces the rate which is 90 percent of the average five-year Treasury security yields for the six months before the rate announcement. Bonds earn these rates right from the start; the current rate is 4.6 percent (announced November 1). The new rate was announced May 1. Bonds cashed before five years are subject to a three-month interest penalty.



Savings bonds provide numerous other advantages. Interest earned is not subject to state or local taxes, and federal tax liability can be deferred until the bonds are cashed. In addition, when bonds are redeemed for the purpose of financing higher education—yours or your children's—interest earned under some circumstances is completely tax free.

NASA's goals this year are to have a 50 percent participation rate with an overall increase of at least 5 percent participation and a 10 percent increase in the level of savings by current participants.

For additional information, contact your directorate campaign coordinator or Teresa Sullivan at x31034. ■

Exploration Office hosts amateur rocket launch

On April 8, JSC's Exploration Office hosted an amateur rocket launch on the antenna range behind Bldg. 14. Participants included JSC co-ops, German graduate students and members of the NASA-Houston Rocket Club.

"JSC has hosted numerous regional and national model rocket competitions

over the past thirty years," said John Connolly, who serves as the "launch director" for events sponsored by the Exploration Office. "Of course, we're always extremely safety conscious. All the rockets need to correspond to basic principles of stable rocket design, as well as local rocketry rules. The rockets also have to abide by

altitude limits set by local air traffic."

There is no schedule for the launches. The events are usually held a few times during the year. Some of the launches are held to celebrate events such as a co-op's last week in the Exploration Office or even the arrival of daylight savings time. "The launch window is an hour longer," Connolly said.

The NASA-Houston Rocket Club holds launches on the first and third Saturdays of every month. Everyone is welcome to attend. ■

On April 8, JSC rocketeers gathered on the antenna range behind Bldg. 14 to launch their homemade rockets. The launch, sponsored by the Exploration Office, was a friendly competition among JSC co-ops, German graduate students and other model rocket enthusiasts.



JSC Photo S99-04861 by James Blair

C O M M U N I T Y N E W S

New York kids in orbit over JSC contacts

By John Ira Petty

Johnson Space Center has become a focal point for a group of pretty remarkable students at a New York high school. They've even made Eileen Hawley, news chief in Public Affairs' Information and Media Support Branch, an honorary astronomy class member.

It all began with STS-95.

Linda Mantovi, who with aide Steven Sgandurra teaches the eight-member astronomy class at the Hallen School in New Rochelle, N.Y., began a unit on the mission last October, about a month before the October 29 launch.

Before STS-95 was ready to land on November 7, many of the 270 students at the school were following the group's activities, mostly via enlarged printouts of e-mails Mantovi posted on the school's bulletin board.

The private school serves grades kindergarten through 12. Its students are from all over the tri-state (New York City) metropolitan area. They are emotionally disturbed, and have been referred to the Hallen School by their home school districts. They face a variety of challenges and come from a wide range of backgrounds.

Many are very intelligent, Mantovi said, and they thrive in the school's nurturing environment. Some earn what amount to honors diplomas and a number go on to college. The school prepares others for work-study programs.

"It's a great group of kids," she said. "Eileen is extremely important to them. People who don't work with kids don't realize the kind of impact a person like her can have."

The STS-95 flight really fueled the enthusiasm of the astronomy class. Most of the eight are high school juniors.

The unit, focusing on John Glenn, began with e-mail messages from the students to Johnson Space Center people. Mantovi said that among the responses, Hawley's stood out. An e-mail correspondence began, which was the fodder for the school's bulletin board.

Excitement grew when the students heard Hawley doing commentary from the Mission Control Center, and when on another occasion they saw her responding to questions on television. "Some of them came to me and said, 'This is something I'll remember when I'm old,'" Mantovi said.

An e-mail from the teacher to Hawley on October 30 summed it up pretty well. "There was such a good feel to the class

yesterday. It truly made me understand why I teach," Mantovi wrote.

"You have added so much - these kids really felt important. It was unbelievable to them that you play such a huge part to this mission and still had time for them. You really made these kids feel good. Thank you."

Hawley said that when she first heard from members of the class, "I could actually feel the enthusiasm in their e-mail



Eileen Hawley

JSC Photo DCS00510 by Robert Markowitz

note. I knew these were some very special kids indeed. I'm grateful to them and to Linda. They represent our future and I think it looks pretty good."

A self-acknowledged space buff, Mantovi said that by the end of the mission Glenn was like her students' grandfather and space was something personal. "They could see my enthusiasm, and they took it on," she said. "Still, I was surprised they took to the astronomy program the way they did."

She said she wouldn't be surprised if some of them eventually work in the world of science. She hopes they will retain their interest in the space program after high school. "The sky's the limit with these students," Mantovi said. "They can do almost anything they dream of."

Mantovi, 28, taught special education for two years in New York public schools, and has been at the Hallen School, just north of New York City, for two years. She is working on her master's in special education. ■

Asian Pacific American Observance

May 11, 1999

Asian Pacific American Observance at JSC will be held from 11:30 a.m. to 12:30 p.m. May 11 in the Bldg. 3 cafeteria. Three groups have been scheduled to perform under the direction of Josie Travlos.

The dance group Hula Halau O' Loki Mele Mele (Hula School of the Yellow Rose) was formed from members of an Hawaiian cultural group who danced at the group's annual luau. The group will perform Hawaiian music. Hula Halau O' Loki Mele Mele has performed for private parties, at the University of Texas Medical Branch in Galveston and on many other occasions.

Makana Aloha, or "Gift of Friendship," was organized in 1994. Most of the members are residents of the local Clear Lake, Seabrook and Kemah areas. The group is dedicated to preserving Pacific culture and the music, costume and dance of Hawaii. The group has performed at the Seabrook Hula Festival and at



A Polynesian Cultural Association member demonstrates the hula wearing Tahitian attire.

numerous church functions in the local area.

The Polynesian Cultural Association was formed to promote the culture of the seven areas of the South Pacific including Hawaii, Samoa, Tonga, Fiji, Tahiti and the Maori culture of New Zealand. The group has appeared at Shrimporee '98, the Asian Pacific American Heritage parade of 1998 and the "Dancin' in the Streets" parade at the 1996 Houston International Festival, to name just a few. ■

Safety Fair set for May 21

To enhance the welfare of its employees at the workplace, at home, and on the road, Johnson Space Center will host a personal safety fair on May 21. The Safety Fair will run from 10 a.m. to 2 p.m. in the lobby of the historic Mission Control Center and its adjacent parking lot.

A major highlight for the day will be free safety checks of children's car seats for JSC employees and contractors. The checks will be conducted by certified inspectors from the National Highway Transportation Safety Administration (NHTSA), the Texas Department of Health/Safe Riders, the Greater Houston Area National Safe Kids Coalition sponsored by Texas Children's Hospital, and Houston Community College.

"Four out of every five child car seats pose a real safety hazard, either because the children aren't placed in the seats properly, or the seats themselves are not correctly installed in the car," said Harry Crum, NHTSA law enforcement liaison.

"These inspections are potential life savers."

Employees are invited to drive their cars to the Mission Control parking lot for the free inspection service. The inspections are extremely thorough and ensure that the child is securely belted in place and the car seat is

properly anchored. In addition, inspectors check for any possible recall notices on the car seat and demonstrate proper installation techniques.

In addition to the car seat safety checks, the NHTSA will host an information

booth in recognition of "National Buckle Up Week," encouraging drivers and passengers to belt themselves in place every time they take a car on the road.

The Safety Fair, which also features presentations and information on personal watercraft safety, tips for avoiding car theft, home fire protection, and hurricane safety, is part of JSC's "Voluntary Protection Program" safety campaign to ensure a safe workplace. ■

Request for Volunteers

Volunteer "scribes" are needed to help with child car seat inspections. Scribes would work with the expert inspection teams to document their findings. Interested volunteers should contact Rindy Carmichael at x45078.

GILRUTH CENTER NEWS

<http://www4.jsc.nasa.gov/ah/exceaa/Gilruth/Gilruth.htm>

Hours: The Gilruth Center is open from 6:30 a.m.-10 p.m. Monday-Thursday, 6:30 a.m.-9 p.m. Friday, and 9 a.m.-2 p.m. Saturday. Contact the Gilruth Center at x33345.

Sign up policy: All classes and athletic activities are on a first-come, first-served basis. Sign up in person at the Gilruth Center and show a yellow Gilruth or weight room badge. Classes tend to fill up two weeks in advance. Payment must be made in full, in exact change or by check, at the time of registration. No registration will be taken by telephone. For more information, call x33345.

Gilruth badges: Required for use of the Gilruth Center. Employees, spouses, eligible dependents, NASA retirees and spouses may apply for photo identification badges from 7:30 a.m.-9 p.m. Monday-Friday and 9 a.m.-2 p.m. Saturdays. Cost is \$10. Dependents must be between 16 and 23 years old.

Nutrition intervention program: Six-week program includes lectures, a private consultation with the dietitian and

blood analysis to chart your progress. Program is open to all employees, contractors and spouses. For additional information call Tammie Shaw at x32980.

Defensive driving: One-day course is offered once a month at the Gilruth Center. Pre-registration required. Cost is \$25. Call for next available class.

Stamp club: Meets every second and fourth Monday at 7 p.m. in Rm. 216.

Weight safety: Required course for employees wishing to use the Gilruth weight room. Pre-registration is required. Cost is \$5. Annual weight room use fee is \$90. The cost for additional family members is \$50.

Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays. Cost is \$24 for eight weeks.

Step/bench aerobics: Low-impact cardiovascular workout. Classes meet from 5:15-6:15 p.m. Tuesdays and Thursdays. Cost is \$32 for eight weeks. Call Kristen Taragzewski, instructor, at x36891 for more information.

Yoga: Stretching class of low-impact exercises designed for people of all ages and abilities in a Westernized format. Meets Thursdays 5-6 p.m. Cost is \$32 for eight weeks. Call Darrell Matula, instructor, at x38520 for more information.

Ballroom dancing: Classes meet from 7-8:15 p.m. Thursdays for beginner advanced classes and from 8:15-9:30 p.m. for beginner-intermediate and intermediate students. Cost is \$60 per couple.

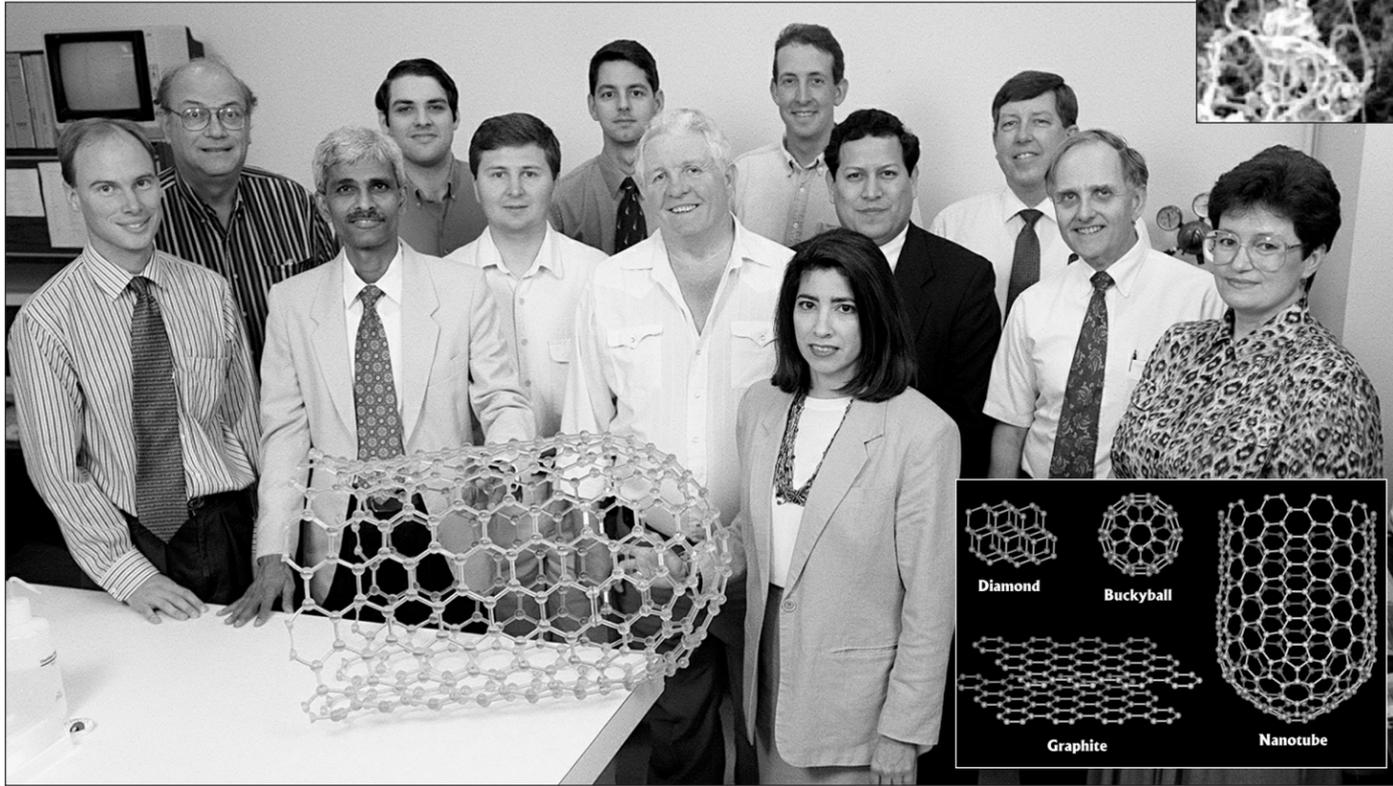
Country and western dancing: Beginner class meets 7-8:30 p.m. Monday. Advanced class (must know basic steps to all dances) meets 8:30-10 p.m. Monday. Cost is \$20 per couple.

Fitness program: Health-related fitness program includes a medical screening examination and a 12-week individually prescribed exercise program. For additional information call Larry Wier at x30301.

Carbon nanotubes: *JSC's role in the advancement of nanotechnology*

By Beatrice Santos

- ◆ A millimeter diameter cable capable of lifting the weight of four average cars
- ◆ Nanorobots that travel through the bloodstream removing plaque and bacteria
- ◆ Stronger composite structures at a fraction of the weight
- ◆ A balance capable of weighing single cells in the 10^{-15} gram range



The Nanotube team members are from left, front: Brad Files, Sivaram Arepalli, Pavel Nikolaev, Benny Ewing, Beatrice Santos, Rick Barrera, Carl Scott, and Olga Gorelik; back: Joe Victor, William Holmes, Brian Mayeaux, Leonard Yowell, Bill Proft. Team members include employees of NASA, GB Tech, Lockheed Martin, Hernandez Engineering and Rice University.

The scenarios listed above are at least theoretically possible because of the relatively new field of nanotechnology. Nanotechnology could enable significant technological advancements for future space flight. Advancements such as ultra-lightweight composites, advanced energy storage devices and nanoscale computers to govern nanorobots might all be possible using carbon nanotubes. An ongoing project led by Brad Files of the Manufacturing, Materials and Process Technology Division (MMPTD) at JSC is focusing on carbon nanotubes for such applications.

What Are Carbon Nanotubes?

Fullerenes were discovered in 1985 at Rice University by Richard Smalley, Robert Curl and Harold Kroto, who were awarded the Nobel Prize in chemistry in 1996. The most basic fullerene is comprised of 60 carbon atoms arranged in a geodesic pattern, named the buckyball (inset above) in honor of Buckminster Fuller. A carbon nanotube is an elongated buckyball about a nanometer in diameter (about 1/50,000th the diameter of a human hair). NASA shares the growing interest in single-walled carbon nanotubes because of their extraordinary mechanical, electrical and optical properties. In the axial direction, they exhibit electrical conductivity as high as copper, thermal conductivity as high as diamond and strength approximately 100 times greater than steel at 1/6th the weight. According to Richard Smalley, "It should be the strongest fiber that you can make of anything – ever. In the strength/ weight ratio sweepstakes, it should be the ultimate fiber."

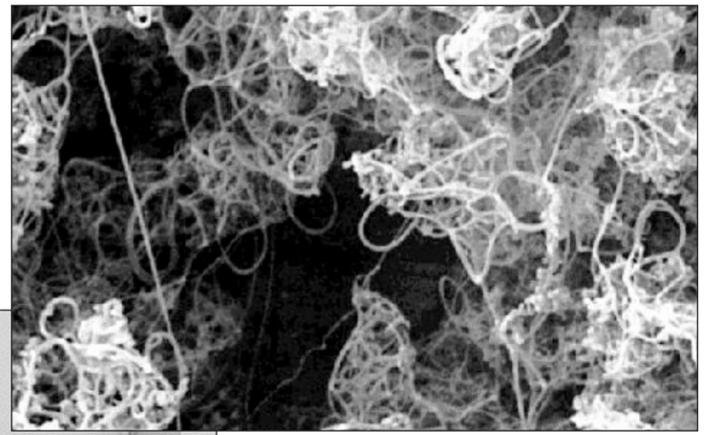
JSC's Role in Nanotechnology

In 1997 Lubert Leger, former deputy chief, MMPTD, spearheaded the construction of a nanotube production facility at JSC, modeled after the Rice University facility. In



Beatrice Santos, left, and operator Olga Gorelik run the nanotube purification facility.

1998, NASA Administrator Dan Goldin and Malcolm Gillis, president of Rice University, signed a cooperative agreement pledging a collaborative effort between the two institutions to develop carbon nanotechnology. For more information on JSC's ongoing efforts and the latest nanotube developments for space applications, see the monthly newsletter at <http://www.jsc.nasa.gov/ea/em/nano>.



Unpurified nanotube rope image taken by scanning electron microscopist Lou Hulse.

'Nanotube composites will have a strength-to-weight ratio of 10-100 times that of today's structural materials.'

—Brad Files

Current Activities at JSC

The laser nanotube facility, headed by Sivaram Arepalli (GB Tech), uses two pulsed lasers impinging on a composite graphite target to produce and study the growth mechanisms of nanotubes. It is one of the few facilities in the world focusing on understanding nanotube formation. This understanding could lead to bulk production methods, thereby

reducing cost and increasing worldwide availability. Another promising method for bulk production being investigated is the arc method. Built under the direction of Carl Scott (Structures and Mechanics Division), it uses an electric arc to vaporize an anode to produce nanotubes.

The major goal of the MMPTD project is development of composites for structural applications. After production, the nanotubes are processed in the purification facility, which was built by Beatrice Santos (MMPTD). They are then ready for incorporation into epoxy composites for testing. Future work will include evaluation of various composite matrix systems. A complementary study is being conducted by Enrique Barrera (Rice University) using thermoplastic composites for electrically conductive applications. Dr. Barrera is a senior fellow of the National Research Council, currently on sabbatical at JSC.

In addition, JSC supports nanotechnology development through the Small Business Innovative Research Program. There are several applications being investigated including the use of nanotubes for low power flat panel displays and ultracapacitors for energy storage.

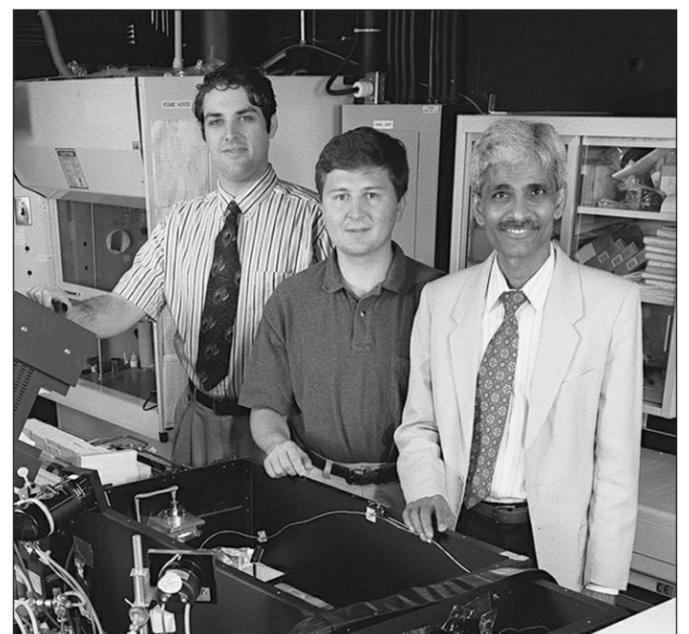


JSC Photo S99-04478 by James Blair
Brad Files, left, and Rick Barrera inject a nanotube epoxy composite.

Toward the Future

Carbon nanotechnology could make human interplanetary space exploration a reality through the creation of advanced technologies which were science fiction only ten years

ago. The prohibitive weight penalty of current interplanetary spacecraft could virtually disappear with the application of nanotechnology. According to Doug Cooke, manager of JSC's Exploration Office, "It takes forty pounds of spacecraft and systems in low earth orbit to get each pound of mass to the Mars surface and back. Nanotechnology in structures is important for all space travel. [It] has the potential for us to make the next big step since Apollo." ■



JSC Photo by S99-05259 by Mark Sowa
William Holmes, Pavel Nikolaev, and Sivaram Arepalli work in the laser nanotube production lab.

J S C * S S H I N I N G S T A R

NBL's Hammack still making waves

By John Ira Petty

Sandra Hammack made quite a name for herself as a swimmer at Clear Creek High School, Texas Tech and Southern Methodist.

Now, after getting her degree in anthropology and working on underwater projects for NOAA, the National Park Service and the Smithsonian Institution, she's still making waves. She's been a diver at JSC's Neutral Buoyancy Laboratory for almost two years.

That's an understatement. In addition to setting state records and being an All-American swimmer in high school, she was an All-American in water polo too. She also ran track.

In college, two years at Texas Tech and then two years at SMU after Tech dropped its swimming program, she was on full scholarship and went to nationals all four years in the 50- and 100-meter freestyle. She was ranked as high as 5th nationally.

Hammack was born in Florida, but grew up in the Clear Lake area. Her father, Jim Hammack, worked for NASA at Kennedy Space Center and Johnson Space Center. Building boats was one of his hobbies.

"I had my first boat when I was five," Sandra Hammack said. "My dad built a little gaff-rigged boat for me, with red sails. We had a 500-foot pier on Galveston Bay and my father would tether my boat to the end of it with a long line when I sailed it."

She studied anthropology, because she wanted to go into underwater archaeology. She also studied photography, with archaeological documentation in mind.

After graduation from SMU in 1989, Hammack interned with National Park Service, mostly doing research. Subsequently she worked for a year with the Smithsonian Institution's Maritime History Program, doing underwater archaeology and scrimshaw research, and then worked for National Oceanographic

"I am very much a water person."

—Sandra Hammack



Sandra Hammack

JSC Photo S99-04261 by Robert Markowitz and Chris Rupert

and Atmospheric Administration's National Marine Sanctuary Program, mostly in the Florida Keys and off California.

While she was with the Smithsonian, she coached the swimming team of Galludet University in Washington, D.C., a Division III school for the hearing impaired.

The next job was in Florida, working for Sea World in Orlando, as an animal trainer. "I was there for a little over two years, and it was a blast." She worked with bottlenose dolphins, pseudorca (false killer whales), beluga whales, polar bears, walrus, and harbor seals.

"All of my jobs have been dream jobs for me," she said. "I've had great bosses, and in that type of work, the people are usually fun and interesting."

She transferred to Sea World in San Antonio to be closer to home and her father, who was ill. She was hired by the NBL in July 1997, and then was hired to work at the NBL.

As a safety diver, she ensures the safety of astronauts training at the NBL for space walks. As a utility diver she helps set up tests, place and move shuttle and space station mockups and move the astronauts from place to place during their training. Divers also make sure the astronauts and their equipment are as nearly weightless in the pool as possible.

Hammack also does a lot of still and video photography of the training. Another of her roles involves conditioning training for new divers joining the NBL team.

The family still has four boats. One is a black-hulled, double-ended sharpie almost 30 feet long beautifully built by her father, who died about two years ago. The other three are sailboats too, smaller than Vulture.

Sandra Hammack dives even on days off. She and a friend have a small business (called Scrub A Tub), cleaning and doing minor repairs on boat hulls underwater.

She finds the work at the NBL fascinating. Among the first crews she helped train was that of STS-88. She traveled at her own expense to Kennedy Space Center to watch its launch in December.

"It was amazing, great," she said of the night launch. "Seeing the end product helps make it all worthwhile." ■

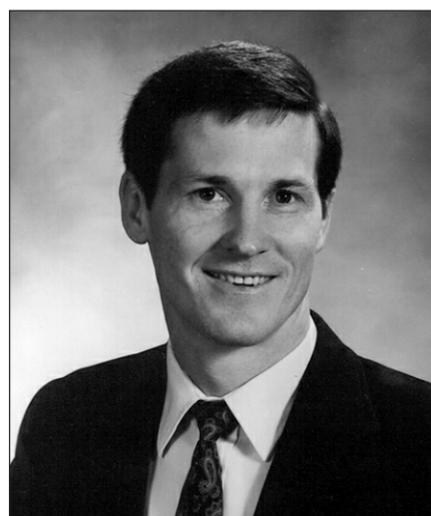
White Sands engineer receives Painter Memorial Award

Joel Stoltzfus, project manager/engineer, White Sands Test Facility, has received the 1998 Robert J. Painter Memorial Award from Committee G-4 on Compatibility and Sensitivity of Materials in Oxygen Enriched Atmospheres. The award honors Stoltzfus for his outstanding service in the area of fire hazards and oxygen systems. The award was originally established in 1956 as the American Society for Testing and Materials-Standards Engineering Society Award. In 1976, it took on its new name and the SES assumed its administration.

A resident of Mesilla Park, N.M., Stoltzfus earned his B.S. degree in mechanical engineering in 1978 from

New Mexico State University, Las Cruces, N.M. He began his professional career in 1978 as a mechanical engineer at White Sands. Stoltzfus' career has been oriented from the outset toward understanding and controlling fire hazards in oxygen systems. In 1989, he assumed his current position with NASA.

During his career, Stoltzfus has concentrated on designing and developing several test methods for the ignition and combustion of metals and metal alloys in oxygen-enriched atmospheres. His recent efforts have focused on application of data to actual hardware; developing hazards analysis approaches for NASA; developing educational tools for training of engineers



and technicians in addition to designing and operating oxygen systems.

Stoltzfus has been a member of ASTM since 1984. He is a member of Committee G-4 as well as five subcommittees of the parent committee.

Outside of ASTM, Stoltzfus is a member of the National Fire Protection Association's Technical Committee 53 on Oxygen-Enriched Atmospheres.

Committee G-4 is one of 130 ASTM technical standards-writing committees. Organized in 1898, ASTM is one of the largest voluntary standards development organizations in the world. ■

Joel Stoltzfus

STS-95 crew receives Morrow Public Outreach Award



THE DOUGLAS MORROW PUBLIC OUTREACH AWARD was presented to the STS-95 crew during ceremonies marking the 15th National Space Symposium April 5-8 in Colorado Springs.

Each year the Morrow Award is presented to an individual, organization or team judged to have made the single most significant contribution to public understanding and awareness of U.S. space endeavors — civil, commercial or national security. The return to flight of space pioneer Sen. John Glenn, Spain's first astronaut Pedro Duque and a number of unique mission elements combined to focus the most significant worldwide media and public attention on space in recent history.

The Morrow Award was accepted on behalf of the STS-95 crew by Pilot Steve Lindsey, Payload Specialist Chiaki Mukai and Mission Specialist Pedro Duque. ■

Ripped from the ROUNDUP

Ripped straight from the pages of old Space News Roundups, here's what happened at JSC on this date:

1 9 8 4

A month into its new lease on life, luck is still with the Solar Maximum Mission satellite.

At about 6 p.m. CST April 24, thirteen days after being repaired during Shuttle Flight 41-C, Solar Max was able to observe the largest solar flare seen on the Sun since 1978.

The flare observation came less than one hour after Solar Max's 30-day checkout was interrupted for an operational look at a volatile region on the Sun. It was a pointing maneuver combining skill and luck which has delighted scientists at the Goddard Space Flight Center.

Solar flares are violent events most commonly associated with magnetic interactions and sunspot activity, and are a major source of the intense geomagnetic storms felt throughout the solar system.

1 9 8 9

The Space Shuttle *Atlantis* and her four-man one-woman crew crackled into orbit Thursday afternoon, easily meeting their deadline for getting the Magellan probe in position to begin its journey to Venus. The launch took place at 1:47 p.m. Thursday following an abbreviated countdown that – along with speedy repair work by Kennedy Space Center workers – prepared the shuttle for liftoff one day earlier than was expected after last Friday's launch scrub.

1 9 9 4

The International Microgravity Lab-2 was secured in *Columbia's* cargo bay at Kennedy Space Center this week and the main engines were installed, keeping the preparations for STS-65 on track for an early July launch.

Columbia is in KSC's Bay 2 processing hangar, and it will remain there until early June, when it will be moved to the Vehicle Assembly Bldg. to be mated with the STS-65 solid rockets and fuel tank. Ongoing work on the maiden shuttle includes checks of the IML-2 electrical connections, tests of the drinking water system, installation of the Spacelab tunnel and installation of the sleep stations used during the around-the-clock crew operations.



Crosswalk Awareness Week

May 24 - 28, 1999

Watch for activities and information focused on increasing driver and pedestrian crosswalk safety. Highlights will include:

- ◆ Celebrity Crossing Guards
- ◆ Special Guest Speaker
- ◆ Motorcycle Safety Activities
- ◆ Special Edition of Total Health and Safety Newsletter
- ◆ Crosswalk Awareness Contest

Crosswalk Awareness Contest Rules

As part of Crosswalk Awareness Week activities, the 10 crosswalks with the most Close Calls in the last year will be identified with a special "Top 10" yellow sign and numerical designation 1 to 10.

- Objective: Find the 10 most dangerous crosswalks on site.
- How to play: Submit entries via e-mail to ssafety@ems.jsc.nasa.gov
- Subject line: Crosswalk Contest
- Deadline: 5:00 p.m. Wednesday May 26

All correct entries will receive a prize, with Crosswalk Awareness Week T-shirts going to the first 10 correct entries.

Near fatal car crash recalled at rally

By Mary Peterson

"How much blood must be spilled before you learn?"

This sobering question was put to the crowd, most of whom were old enough to be the speaker's parent, or in some cases, grandparent. The admonition: Don't ever, ever think you're lucky enough that you don't need to wear a seat belt.

The occasion was the SR&QA VPP rally held April 13 at Gilruth Center, where more than 400 people from throughout the directorate had gathered to reinforce their knowledge of safety, health, and VPP, and the diminutive 19-year-old had a dramatic and powerful story to tell.

Brandy Carmichael, daughter of Hernandez Engineering's Rindy Carmichael, had celebrated her 17th birthday less than a month before the tragedy on January 20, 1997, that would change her life forever. She began, "I am here to tell my story. It is not pretty, and I can't give people the full effect sweetly."

On that dark day, a school holiday and a homework-free night, Carmichael, her boyfriend, and two other teenage friends had left the movie theater at Mall of the Mainland in Texas City and were heading home, mindlessly engaged in happy teenage chatter, when the unthinkable happened. A car in front made an unexpected turn to go back in the other direction when it skidded into gravel and crashed into their car – head on. The driver, a 16-year-old boy, was killed.

Carmichael, the most seriously injured, was life-flighted to the University of Texas Medical Branch in Galveston where, it was later learned, the doctors had written the grim notation, "Not expected to survive."

She described her fate. "My brain was bruised and bleeding. I had cuts branding my face and broken out teeth. My elbow was shattered, my pinkie finger was broken, my lung and spleen were ruptured, and my collarbone, pelvis, and right leg were broken. Most of my right side was crushed." All this – in spite of the fact that

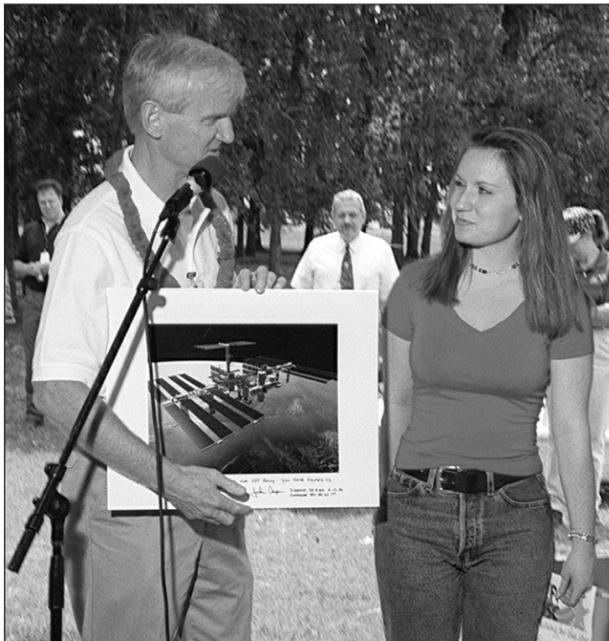
A living miracle, Carmichael graduated on time with her class and enrolled at a local college. The scars have mostly healed, and she doesn't look very different from a million other 19-year-olds. But the trauma remains. The mind is active, even creative, but the speech has slowed and thoughts are more deliberate.

"Our screams still haunt the night, and that boy's premature death still haunts my soul," said a much older-sounding Carmichael. When someone asked how this had changed her, she replied, "I am not the carefree spirit I was before. I don't take anything for granted. The teenage 'happy talk' is gone. I don't feel 'invincible' any more." And as a final reminder, she said, "Please let my story, my blood, be enough." On not wearing a seat belt, she said, "Ask yourself, 'Is it worth it?' I was lucky – but will you be?"

Prior to Carmichael's moving testimony, SR&QA Director John Casper welcomed the employees to the planned events, citing a good year in safety, but reminding everyone that much work is yet to be done before JSC can meet the world-class levels in safety to which it aspires. The remainder of the time was devoted to demonstrations and informational booths covering a wide range of safety and health topics that, according to Casper, "was more than just good – it was like a mini-Safety and Total Health Day."

Thanks go to SR&QA's Jeff Evans and CeCe de la Garza for planning and organizing the event.

(Anyone who would like the full text of Brandy Carmichael's testimony may contact Rindy Carmichael at x45078 or e-mail rcarmich@ems.jsc.nasa.gov.)



JSC Photo S99-05055 by Benny Benavides
Astronaut Col. John Casper thanks Brandy Carmichael for her testimonial with a personalized artist's rendering of the space station.

she was wearing her seat belt – yet it was the one thing that saved her life.

Then a remarkable thing happened. "Life replaced the dark cloud above me, and without realizing my surroundings, I became very determined," Carmichael said. "But I had a difficult road. I was a baby again. I could not speak for three weeks. I literally had to learn to live and function again. I had to learn how to feed myself, how to bathe, how to communicate. I remembered almost nothing of what we daily take for granted."

TICKET WINDOW

Exchange Store hours

Monday-Friday

Bldg. 3 7 a.m.-4 p.m.

Bldg. 11 9 a.m.-3 p.m.

All tickets are non-refundable.

Metro tokens and value cards are available.

For more information, please call x35350.

The following discount tickets are available at the Exchange Stores:

General Cinema Theaters	\$5.50
Sony Loew's Theaters	\$5.00
AMC Theaters	\$4.75
Fiesta Texas	adult ..\$18.25 ..(child under 48") ..\$15.50
Astroworld Early Bird (valid through May 31)	\$17.75
Astroworld One-day Admission	\$21.00
Astroworld Season Pass	\$54.75
(valid at all Texas Six Flags Theme Parks and Water World)	
Water World	\$10.75
Moody Gardens (2 of 6 events)	\$9.75
Sea World	adult ..\$27.25 ..child (age 3-11) ..\$18.25
Schlitterbahn Water Park	adult ..\$20.75 ..child (age 3-11) ..\$17.50
Space Center Houston	adult ..\$10.25 ..child (age 4-11) ..\$6.50
(JSC civil service employees free.) Annual pass ..\$18.75	
Splash Town Water Park	adult ..\$14.50 (child 48" and under) ..\$11.50

Russians roll out Service Module

By John Ira Petty

The Service Module, a major Russian contribution to the International Space Station, was formally introduced at a press conference-rollout ceremony at RSC-Energia at Korolev, near Moscow.

The Service Module is to become the third major element of the ISS. It is to be transported in mid-May to the launch site at Baikonur for launch later this year.

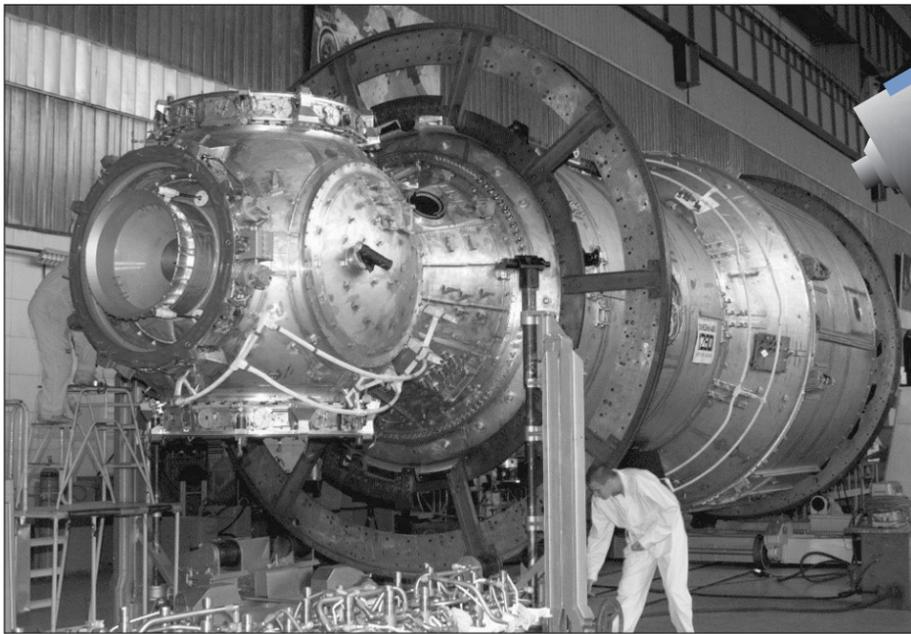
The ceremonies at Korolev attracted about 300 people, including representatives of major media organizations from throughout the world. The 13 participants in the press conference included Mike Baker, NASA's head of human space flight programs in Russia, Yuri P. Semenov, president of Energia and its general designer, and other top leaders in Russia's human space flight program.

Semenov said he believed cooperation between the space agencies of the two countries would continue. Baker said he believes the Russia-U.S. partnership is very strong. "We work very well together," and we look forward to a long future of cooperation in space.

Those attending the ceremonies at Energia, just north of the Russian capital, were treated to a visit to the company's museum. It houses artifacts from the pre-Sputnik era through the International Space Station. Displays include the capsule of Yuri Gagarin, the first man in space.

The press conference began in the modern, theater-like facility after a film on

the Russian space program was shown. Among others at the participants' table were Yuri N. Koptev, general director of the Russian Space Agency; Anatoli Kiselev, general director of Khurnichev



The Service Module will be the first fully Russian contribution to the International Space Station and will serve as the early cornerstone for the first human habitation of the station.

State Production and Scientific Center; Valery V. Ryumin, vice president and ISS program manager of Energia, and Frank Longhurst, European Space Agency Program Manager for the ISS.

Russian officials said at the press conference that a decision on deorbiting

their space station Mir, expected by some in April, would not take place before the summer. They said they were seeking private funding to keep the aging station aloft. Indeed, Koptev said they

were close to finding private funding to keep Mir in orbit.

In no case will deorbit occur before August. Koptev said Mir would stay in orbit through 1999, even if finances prevented it from being crewed during part of that period.

The Russians continue to say they will meet their commitments to the ISS, as they are financially able to do so.

After the press conference, participants and the audience moved to an adjacent shop building. After putting on white lab

coats, they walked to an area where the 43-foot-long Service Module itself was displayed, for brief ceremonies there and filming.

The low-key ceremony reflected a major milestone in the ISS Program.

The Service Module is the first Russian-financed and Russian-built contribution to the ISS. It includes living quarters for early station crews, a life-support system, a propulsion system as well as electrical power distribution, a data processing system, and a flight control system. Its communications system will give flight controllers on the ground remote command capabilities.

Even after some of its functions are supplemented or taken over by U.S. elements to be launched later, the 42,000-pound Service Module with its three pressurized compartments will remain the center of the Russian part of the ISS. ■

JSC Clinic offers bone density testing for women

The JSC Clinic is proud to announce the acquisition of the Sahara ultrasound bone densitometer. This device is used to help assess bone density. The test is performed in a seated position with your bare foot comfortably placed in the ultrasound unit.

The entire procedure takes about one minute. It involves no discomfort, no injections, and no invasive procedures. High-frequency sound waves are passed

through your heel and the bone density is estimated from characteristics of the transmitted sound waves. The ultrasound unit immediately processes your test results. A physician will discuss the results with the patient.

Beginning June 1, 1999, this test will be included as part of the annual physical exam testing for women. Women desiring to take the test apart from their yearly

physical exam and contractor personnel who want to take this test should call the JSC Clinic at x34111 to schedule an appointment.

Additional information may be obtained by contacting the clinic's nursing staff at x37783. Although this test can be performed only on women now, the Food and Drug Administration is currently evaluating a bone density test for men. ■

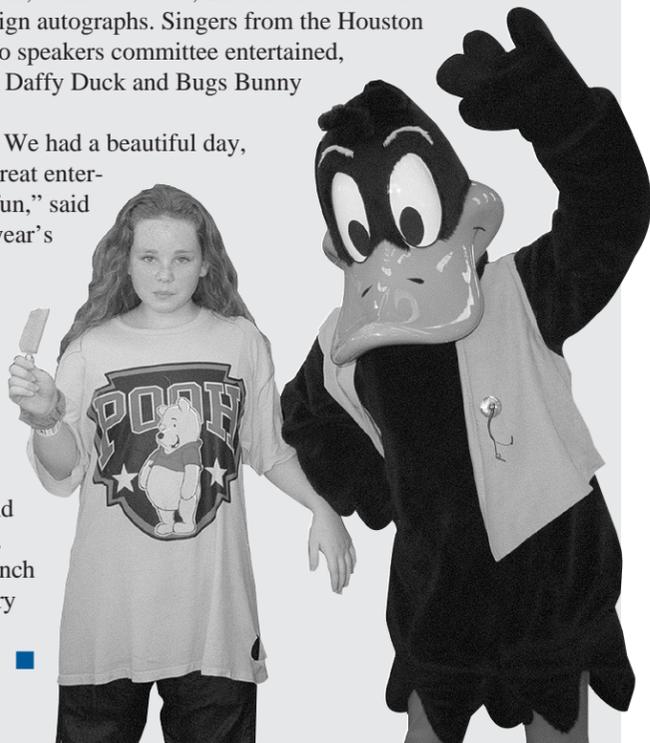
Sunshine, friendship, fun highlight JSC Family Picnic

Sunshine, barbecue and thrills were the highlight at the April 11 NASA-JSC Family Picnic as a sellout crowd took advantage of the opportunity to mingle with friends and experience the excitement of Astroworld.

JSC Employee Activities Association President Ginger Gibson said this year's picnic, the fifth consecutive one to be held at Astroworld, drew more than 3,000 NASA employees, retirees, contractors and their families and friends. Astronauts Mike Massimino, Susan Still, Willie McCool, Ellen Baker and Carlos Noriega were on hand to sign autographs. Singers from the Houston Livestock Show and Rodeo speakers committee entertained, and Astroworld characters Daffy Duck and Bugs Bunny amused the crowd.

"It was a great success. We had a beautiful day, there was good food and great entertainment and Astroworld fun," said Gibson, who chaired this year's picnic committee.

This photograph shows some of the fun that took place at Astroworld's A&W Ranch, where JSC employees gathered to enjoy barbecue and each other's company, play horseshoes or volleyball and listen to music. In addition, those who made it to the ranch received free complimentary passes for another visit to Astroworld later this year. ■



JSC Safety Alert

Hot Work Hazards

What Happened

A small fire erupted at the MSFC in Bldg. 4755 where hardware mockups were being stored in support of the International Space Station. The building was evacuated, and the fire was quickly contained and extinguished by the Redstone Fire Department. No one was injured, and after the residual smoke was exhausted from the building, employees were allowed to return to work.

Outcome of the Investigation

The exact reason for the fire is under investigation. The preliminary investigation suggests that slag from a welding operation started the fire. Technicians, setting up an arc welder on the overhead crane above the mockup storage area, struck an arc to test the system and noticed smoke from below almost immediately. MSFC is evaluating the duct and other mockup materials for flammability, based on the rapid development of the fire. Fire damage was limited to a few items of hardware mockups; however, the damage is not expected to have any impact on space station program activities.

What You Can Do

Review hot work permits and setup procedures for your area. All personnel issuing hot work permits should observe the surrounding work areas to ensure flammable materials are removed or properly protected. When working in elevated locations, verify the composition of materials below, and ensure they are protected by flame resistant material where necessary. If you have any questions, consult the facility manager for the specific area before beginning work.

Roundup deadlines

The Space Center Roundup is published every other Friday. Story ideas and articles should be submitted as far in advance as possible, but no later than two weeks prior to the date of publication.

The deadline for Dates & Data calendar items is three weeks prior to the date of publication. Stories and ideas should be submitted to Editor Bill Jeffs in Bldg. 2, Rm. 181, or via e-mail to william.p.jeffs@jsc.nasa.gov.

Retirees should submit change of address notices to the distribution group at Mail GP443 or call Ignacia Ramirez at 281-483-6161. ■

PEOPLE *on the* **MOVE****Key Management Assignments**

Tommy Holloway was named manager, International Space Station Program Office.

Ron Dittmore was named manager, Space Shuttle Program Office.

Charles Price was named branch chief of the Special Projects Office, Automation, Robotics, and Simulation Division, Engineering Directorate.

Bill Bastedo was named deputy manager of the Mission Integration Office, International Space Station Program Office.

Dane Russo was named chief, Crew Station Branch, Flight Crew Support Division, Space and Life Sciences Directorate.

Linda Bromley was selected as chief, Avionics Test and Analysis Branch, Avionics Systems Division, Engineering Directorate.

Vanessa Ellerbee was selected as flight manager, Space Shuttle Program Integration, Space Shuttle Program Office.

Natalie Saiz was named chief, Human Resources Management Branch, Human Resources Office.

Gerald Esquivel was selected as lead for payloads software and avionics integration, Hardware and Software Engineering Integration, International Space Station Program Office.

Additions to the Workforce

Andrew Nash joins the Aircraft Maintenance and Engineering Branch, Aircraft Operations Division, Flight Crew Operations Directorate, as flight systems engineer.

Terry Hill joins the Guidance, Navigation, and Control Development and Test Branch, Aeroscience and Flight Mechanics Division, Engineering Directorate, as a test engineer.

Clinton Baggerman joins the Electronic Design and Development Branch, Avionics Systems Division, Engineering Directorate, as an electronics engineer.

Jim Locke joins the Medical Operations Branch, Medical Sciences Division, Space and Life Sciences Directorate, as a medical officer.

Craig Fischer joins the Space and Life Sciences Directorate as assistant to the director for space medicine.

Promotions

Mirella Barron was selected as an office support specialist in the Aircraft Systems Quality Assurance Branch, Aircraft Operations Division, Flight Crew Operations Directorate.

Nancy Hutchins was selected as a records management specialist in the Information Science Branch, Information Products and Services Division, Information Systems Directorate.

Ginger Milligan was selected as a security assistant in the Security Branch, Support Operations Division, Center Operations Directorate.

Libby Salas was selected as a secretary in the Logistics Division, Center Operations Directorate.

Arlene Bell was selected as a secretary in the Avionics Office, International Space Station Program Office.

Carmen Hollins was selected as a computer assistant in the Medical Sciences Division, Space and Life Sciences Directorate.

Reassignments Between Directorates

Yvette Damien moves from the Space and Life Sciences Directorate to the Public Affairs Office.

Mike Conley moves from the International Space Station Program Office to the Engineering Directorate.

Charles Crews moves from the International Space Station Program Office to the Engineering Directorate.

Jo Hinson moves from the International Space Station Program Office to the Engineering Directorate.

Elvia Ortiz moves from the Mission Operations Directorate to the Engineering Directorate.

Linda Watters-Garcia moves from the International Space Station Program Office to the Office of the Chief Financial Officer.

John Kennedy moves from the Engineering Directorate to the Space Shuttle Program Office.

Mary Plaza moves from the Mission Operations Directorate to the Space Shuttle Program Office.

Mark Falls moves from the Engineering Directorate to the International Space Station Program Office.

Ed Shumilak moves from the Information Systems Directorate to the International Space Station Program Office.

Chuck Lloyd moves from the International Space Station Program Office to the Space and Life Sciences Directorate.

Steve Doering moves from the Mission Operations Directorate to the EVA Project Office.

Retirements

Peggy Nelson of the Mission Operations Directorate.

David Dittmar of the Engineering Directorate.

Ron Gerlach of the Engineering Directorate.

Resignations

Randy Brinkley of the International Space Station Program Office.

Melissa Bodeau of the Mission Operations Directorate.

Katie Chimenti of the Office of the Chief Financial Officer.

DATES & DATA**May 11**

NCMA meets: The National Contract Management Association will hold its education symposium at the University of Houston - Clear Lake May 11. For details, contact Marianne Ruiz at x38528.

May 12

IAAP meets: The Clear Lake/NASA Chapter of the International Association of Administrative Professionals (formerly Professional Secretaries International) will meet at 5:30 p.m. May 12 at Bay Oaks Country Club. Cost is \$16. For details and reservations, call Tami Barbour at 281-488-0055, x238.

Astronomy seminar: The JSC Astronomy Seminar will meet at noon May 12 and 19 in Bldg. 31, Rm. 248A. For more information, call Al Jackson at x35037.

Spaceland Toastmasters meet: The Spaceland Toastmasters will meet at 7 a.m. May 12 and 19 at the House of Prayer Lutheran Church. For details, call George Salazar at x30162.

Communicators meet: The Clear Lake Communicators, a Toastmasters club, will meet at 11:30 a.m. May 12 and 19 at Lockheed Martin, 555 Forge River Rd. For more information, call Allen Prescott at 281-282-3281 or Mark Caronna at 281-282-4306.

Spaceteam Toastmasters meet: The Spaceteam Toastmasters will meet at 11:30 a.m. May 12 and 19 at United Space Alliance, 600 Gemini. For details, call Patricia Blackwell at 281-282-4302.

May 13

MAES meets: The Society of Mexican-American Engineers and Scientists will meet at 11:30 a.m. May 13 in Bldg. 16, Rm. 111. For details, call George Salazar at x30162.

Airplane club meets: The Radio Control Airplane Club will meet at 7 p.m. May 13 at the Clear Lake Park building. For more information, call Bill Langdoc at x35970.

May 14

Astronomers meet: The JSC Astronomical Society will meet at 7:30 p.m. May 14 at the Center for Advanced Space Studies, 3600 Bay Area Blvd. For details, call Chuck Shaw at x35416.

May 19

Scuba club meets: The Lunarfans will meet at 7:30 p.m. May 19. For details, call Mike Manering at x32618.

May 20

Directors meet: The Space Family Education board of directors will meet at 11:30 a.m. May 20 in Bldg. 45, Rm. 712D. For details on this open meeting, call Gretchen Thomas at x37664.

May 24

Alzheimer's support group meets: The Clear Lake Alzheimer's Caregiver Support Group will meet from 7:30 p.m. to 9 p.m. May 24 in the first floor conference room in St. John Hospital, West Building, in Nassau Bay. For more information, call Nancy Malley 281-480-8917 or John Gouveia 281-280-8517.

May 27

National Space Society: The National Space Society will hold the 18th annual International Space Development Conference May 27-31, 1999, at the Hobby Airport Radisson Hotel, 9100 Gulf Freeway. Call 1-800-333-3333 by May 12 for reservations at the \$75 rate.

NASA BRIEFS**ASTRONOMERS DISCOVER 'MIDDLEWEIGHT' BLACK HOLES**

The field of black holes, formerly dominated by heavyweights packing the gravitational punch of a billion Suns and lightweights just a few times heavier than our Sun, now has a new contender — a just-discovered mysterious class of "middleweight" black holes, weighing in at 100 to 10,000 Suns.

Astronomers at NASA and Carnegie Mellon University have independently found evidence for the new type of black holes in spiral-shaped galaxies throughout the universe. The newfound black holes, formed by an unknown process, are 100 to 10,000 times as massive as the Sun, yet each occupies less space than the Moon.

A black hole is a region of space where the force of gravity is so powerful that nothing, not even light, can escape its pull. Until now, scientists knew about two types of black holes: stellar and supermassive. Stellar black holes are the remains of dead stars several times heavier than the Sun, compressed to a diameter of a few miles or less. Supermassive black holes have mind-boggling masses of one million to one billion Suns and may have formed in the early universe from giant gas clouds or from the collapse of clusters of immense numbers of stars.

NASA, USGS RELEASE FIRST LANDSAT 7 IMAGE

For Earth Day, NASA and the U.S. Geological Survey (USGS) unveiled the first image from the Landsat 7 satellite — a view of South Dakota, home of the USGS's data center for Landsat imagery. The resolution of the new image is twice as good as previous Landsat images, distinctly highlighting airport runways, dams, cities, rivers and highways.

Landsat 7 was launched April 15. The satellite is gathering data from Earth's land surface and surrounding coastal regions. Analysis of the data will provide scientists with new information on deforestation, receding glaciers and crop monitoring. After on-orbit testing, NASA will turn the satellite over to USGS to manage.

HUBBLE WATCHES IO, CAPTURES 'SNOW' VOLCANO

While hunting for volcanic plumes on Io, NASA's Hubble Space Telescope captured dramatic images of the volatile moon sweeping across the giant face of Jupiter. Only a few weeks before those images were taken, the orbiting telescope snapped a portrait of one of Io's volcanoes spewing sulfur dioxide "snow."

"Other observations have inferred sulfur dioxide 'snow' in Io's plumes, but this image offers direct observational evidence for sulfur dioxide 'snow' in an Io plume," explains John R. Spencer of Lowell Observatory in Flagstaff, Ariz.



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